ENERGY TECHNOLOGY ENGINEERING CENTER

No. SSWA-AR-0009 Rev. New

OPERATED FOR THE U.S. DEPARTMENT OF ENERGY
ROCKETDYNE DIVISION, ROCKWELL INTERNATIONAL

Page 1 of 18
Orig. Date 12/04/96
Rev. Date

DRR 25117

TITLE: BUILDING T654 SUPPLEMENTAL FINAL RADIOLOGICAL SURVEY PLAN

- APPROVALS -

Originator	12/4/96 R. J. Tuttle.	ER	12/10/96 P. D. Rutherford
Prog. Mgr.	1/23/97 M. E. Lee	QA	1-14-97 S. E. Reeder
RadRem	12/6/96 J. C. Barnes		

REV. LTR.	REVISION	APPROVAL/DATE

CONTENTS

FIGURES

APPENDICES

1. INTRODUCTION

This document provides the procedures for performing a supplemental final radiological survey of the decommissioned Interim Storage Facility (ISF), T654. The scope of this survey includes a 100% direct qualitative scan for gamma exposure rate followed by soil sampling, to depth and at the surface, at locations based on a uniform grid, or as indicated by the qualitative survey. Samples of soil taken throughout the depth of the excavated storage facility will determine the condition of subsurface soil. Samples taken from the surface will determine the condition of soil with a potential for exposure. A search survey using a gamma-ray exposure instrument will locate any significant "hot spots" of contamination, for specific sampling and analysis. The uncontaminated condition of the concrete rubble that was buried in the backfill of the excavation, in 1984, has been adequately documented to allow exclusion of this material from further consideration. (See "Health and Safety Analysis Report", J. H. Wallace, 7/10/84, ISF - Scabbled Concrete Trench Top, on file in T654 decommissioning file.)

This will ensure that the ISF will meet the NRC, DOE and State of California criteria for release of the facility for unrestricted use, and will facilitate performance of a confirmatory survey review. The sampling-inspection-by-variables method will be applied to the data obtained in this survey procedure. The in-house computer code "CumPlot" will be used for data analysis and presentation of survey report results.

This procedure provides for the completion of a final survey for a clean facility. Any areas that exceed limits of this section will be decontaminated per a separate special procedure and an additional survey performed to document those areas as meeting all DOE, NRC and State of California criteria for release of a facility for unrestricted use.

1.1 Facility History

The Interim Storage Facility was constructed in 1958 as an auxilliary facility for the Sodium Reactor Experiment (SRE). A paved area 65 ft by 40 ft was fenced to establish a secure storage facility for the SRE and subsequently other projects. Below-grade storage was provided by eight cells extending 25 ft deep into the ground and bedrock. The cells consisted of 20-inch-diameter pipes in 3-ft-diameter holes. The surrounding space was filled with sand or drilling mud for stability. The top of each cell was sealed. The cell tops were effectively below grade level, in a concrete trench. At the end of life of the facility, this trench was open to the weather.

Radioactive materials were also stored in a variety of casks and containers in and adjacent to the fenced area constituting the facility. All such items were removed after 1981, and decommissioning was begun in 1984. A preliminary survey indicated that the concrete structure and some of the facility paving and adjoining rocks and soil were contaminated. These areas are marked in Figure 1.

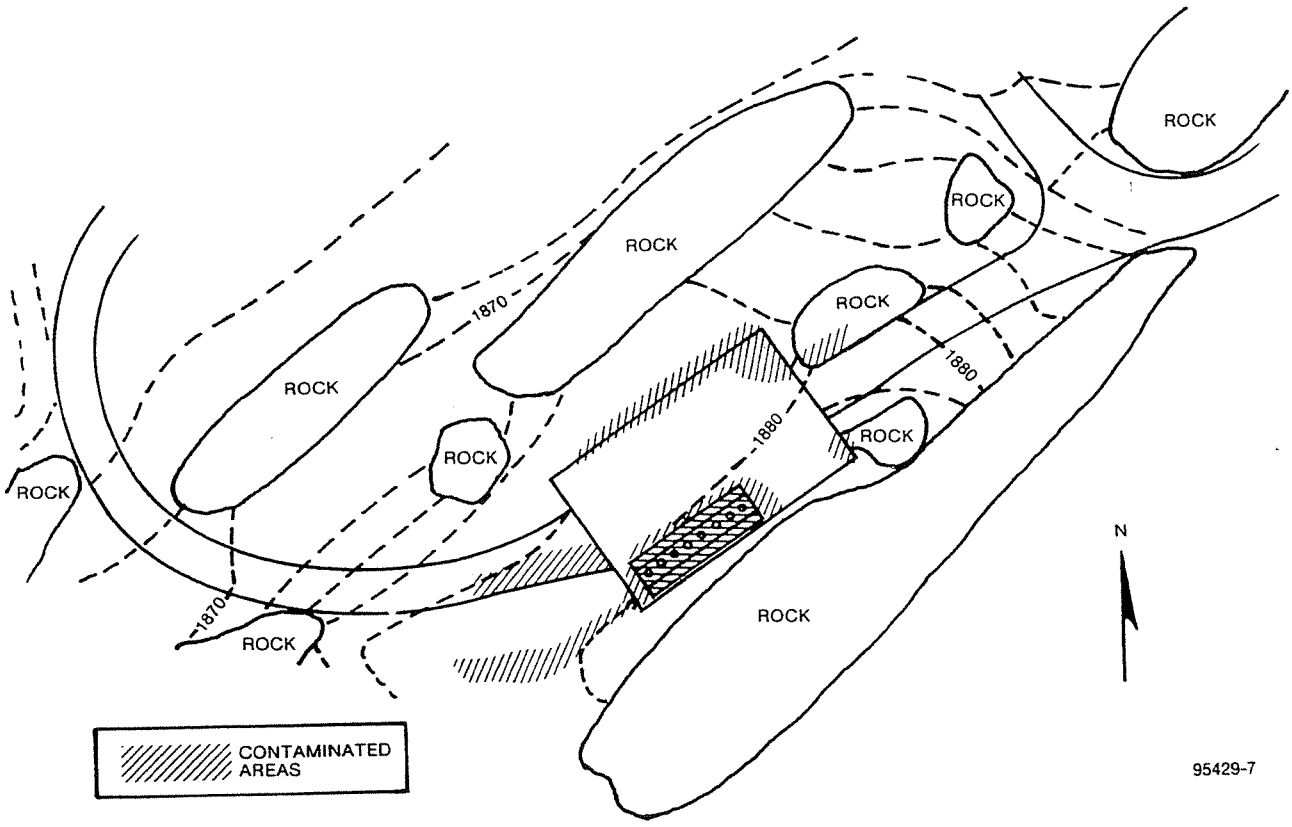

Figure 1. Contaminated areas found at the Interim Storage Facility before remediation.

Decommissioning consisted of locating and removing surface contamination from the paving and the concrete structure of the below-grade storage cells, and complete removal of the below-grade structure (Ref 3.1). The excavation was backfilled with clean concrete rubble that had been surveyed to assure that only material with "No Detectable Activity" was put in the ground. (Review of documents in the T654 decommissioning file showed that only the top of the concrete structure was contaminated and that, after scabbling to remove this contamination, the concrete showed readings that were the same as background, 75-100 cpm with a pancake GM probe.) The excavation was then filled with the local soil that had been previously excavated, and the surface was graded to a natural form. A survey was performed (Ref 3.2), throughout the area indicated in Figure 2. (The structure of the ISF is indicated here for information only. It had been removed before the survey was performed.) This survey showed the facility to be acceptable for release for unrestricted use.

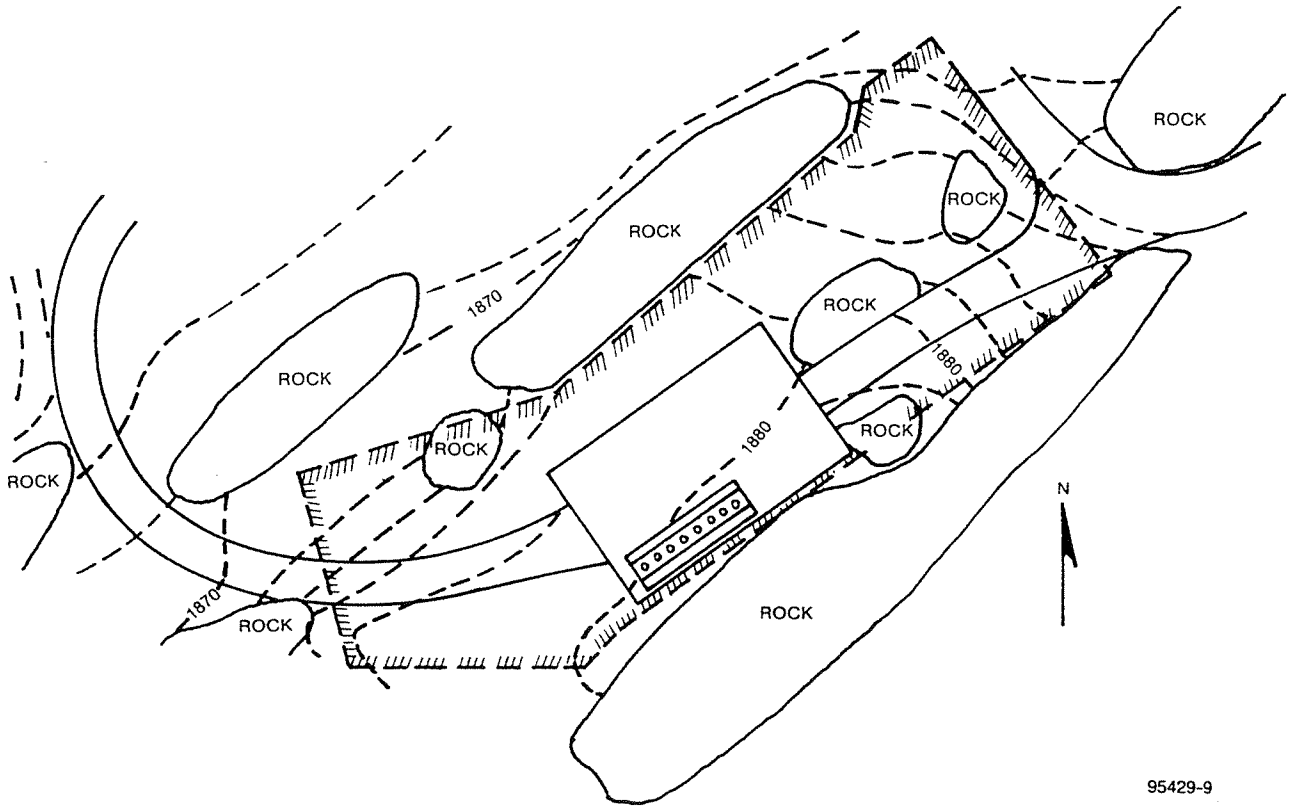

Figure 2. Interim Storage Facility, showing survey layout for survey in 1984.

A recent review by the DOE Independent Verification Contractor (Ref 3.3), judged that the documentation of the original survey was inadequate by today's standards. Shortcomings identified included the fact that the contamination condition of concrete rubble used as backfill was not quantitatively documented in the report; and that the effectiveness of the qualitative gamma exposure rate survey was compromised by skyshine from radioactive material at the nearby RMHF (then the RMDF). Further, at the time of the IVC review, the subsurface soil was not accessible for sampling.

Review of radiation survey records has now shown that the decontaminated concrete used for backfill had been surveyed in July 1984 by use of a thin-window pancake GM and countrate meter, and by smears counted for both alpha and beta-gamma activity. Countrates were recorded as being between 75 to 100 cpm, with a background of 75 to 100 cpm. Removable activity was recorded as being <10 dpm alpha and <50 dpm beta. These levels are consistent with current limits accepted for "No Detectable Activity" (Ref 3.4). The decommissioning final report stated that clean rubble and soil had been reserved and used as backfill. Therefore, the concrete rubble may be considered to be clean and does not require further inspection.

Current practice for the final survey of such a decommissioned facility includes extensive gamma spectrometry of soil samples supplemented by detailed analyses (gamma-spec, Sr-90, alpha-spec) by an outside laboratory, more detailed documentation of quantitative contamination measurements, and use of radionuclide-specific soil concentration limits for release (Ref 3.5).

It is the intent of the present final survey plan to implement current practice to the extent practical, in order to supplement the original survey and establish a basis for the independent verification survey and eventual release of the facility. This new final survey will be coordinated with the IVC to permit a surveyor from the IVC to be present during the sampling operation, to split and collect soil samples.

The primary nuclides of interest during this survey are Co-60, Sr-90, and Cs-137. Thorium, uranium, and plutonium should be considered as possible contaminants. The only remaining potentially contaminated material consists of surface and subsurface soil.

The current condition of the ISF is shown in Figure 3, with an approximate 3x3 meter square grid overlaid to indicate the intended survey area, and the approximate density of sampling, one sample per square in the affected area. The survey area is roughly 1224 square meters. The affected area, where potential contamination is possible, is shown as a shaded region. The affected area covers 711 square meters, and extends around the former storage facility, to include all areas noted as contaminated in the preliminary survey (Figure 1). The unaffected area encompasses the remainder of the area that was included in the original (1984) final survey.

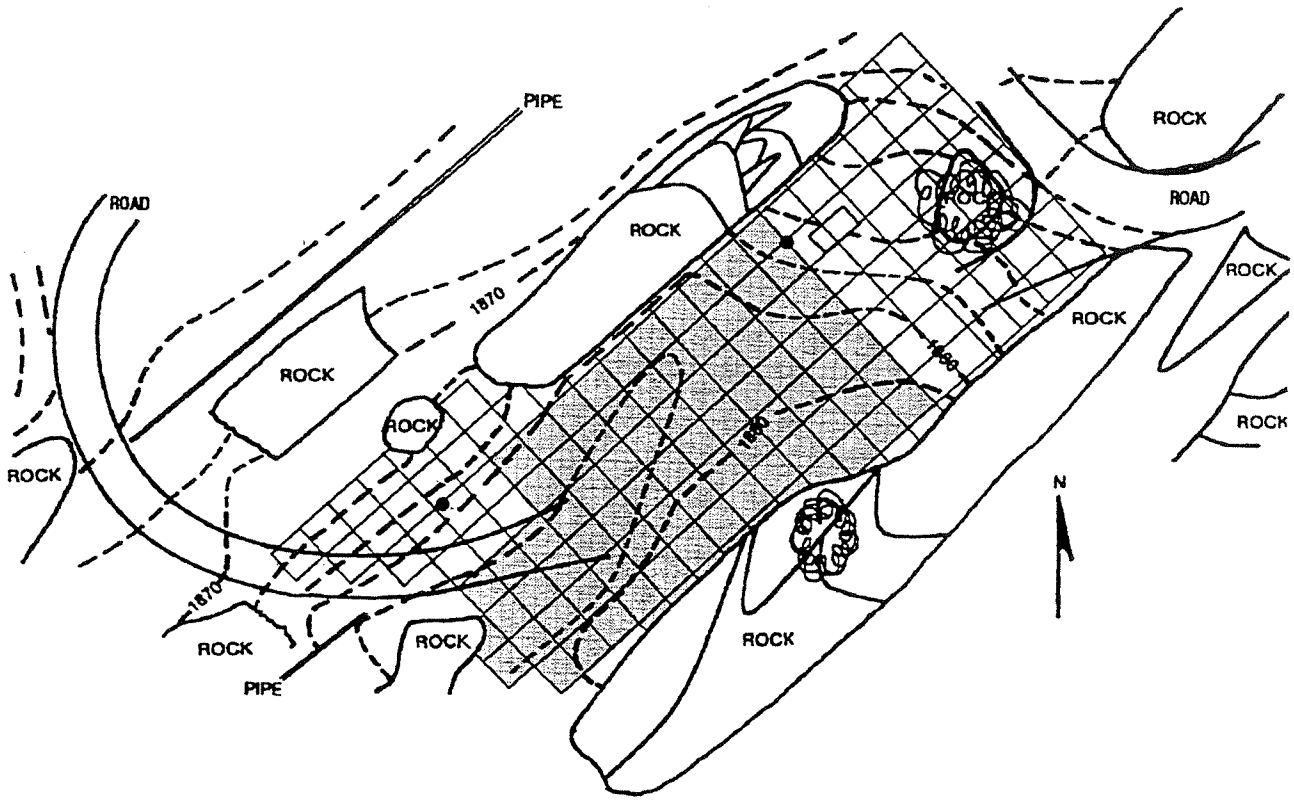

Figure 3. Current condition of the Interim Storage Facility, showing shaded grid over affected area.

2. SAMPLING PLAN OVERVIEW

Comprehensive sampling of the surface of the soil, with gamma spectrometry for radionuclide-specific analysis, will be used to show compliance with the acceptance limits for gamma-emitting radionuclides. The survey and sampling work will be done by, or under the direction of, qualified and experienced field surveyors. Detailed analysis of some selected samples, including those, if any, indicating significant levels of residual gamma-emitting contamination, is expected to demonstrate that other radionuclides are not significant. Approximately 10% of the samples taken in each region (8 affected-surface, 4 unaffected-surface, 2 affected-deep) will be sent to an outside laboratory for detailed analysis including gamma spectrometry, Sr-90, and alpha spectrometry for Th, U, and Pu isotopes.

2.1 Surface Exposure Rate

For the affected area, a direct qualitative scan of 100% of the area will be conducted using a 1x1-inch NaI gamma detector on a long handle to permit a surface scan of the ground. This scan will be done in the same manner as developed for the Area IV Radiological Characterization Survey (Ref 3.6). The unaffected area may be covered less thoroughly, provided that at least 10% of the area, uniformly distributed through the region, is scanned. Any noticebly elevated readings will be identified for subsequent surface soil sampling. It should be noted that the skyshine problem from RMHF may be even more severe than in 1984, as the local exposure rate levels within the RMHF are currently greater than during the earlier survey in 1984. This perturbation will make the qualitative scan highly dependent on the surveyor's skill in noting local increases in the local exposure rate. Since there is not a clearly apparent method for objectively correcting the measurements for the RMHF skyshine, quantitative measurements would have little value in demonstrating compliance.

2.2 Surface Soil Samples

Following the scan, a uniform 3-m x 3-m grid will be established for the facility, with numerical identification starting at the northwest corner. One 1-m x 1-m area within each 3-m x 3-m grid in the affected area will be selected for a surface soil sample. This provides 79 sample locations, 22 more than would be required by the guidance document, NUREG/CR-5489 (Ref. 3.13). In the unaffected area, 35 samples will be taken, uniformly distributed through the grid by chosing a location in every other grid.

Surface soil samples will be taken from the top 6 inches of the soil, in the most suitable location within each selected 1x1 meter grid location, sufficient to fill a 0.5-liter Marinelli beaker. Along the contact of the large rock to the SE of the facility, soil will be collected by scraping along the contact for the length of the affected area, mixing well, and filling a Marinelli beaker.

2.3 Subsurface Soil Samples

A commercial drilling contractor will be used to drill into the previous location of the below-grade storage unit, near each end and in the middle, providing three sample locations. The drilling will go to a depth of 32 feet, or until rock or concrete interferes. Samples will be taken at 8-ft intervals, starting with a surface sample and ending with soil from the bottom of the hole.

2.4 Instrument Calibrations and Checks

The ambient exposure rate at the ground surface will be surveyed using a 1x1-inch NaI scintillation detector with a countrate meter with an audible indication. These instruments will be calibrated quarterly and daily checks will be made using a Cs-137 source.

All portable survey instruments will be serviced and calibrated on a quarterly basis. Daily checks will be performed on all instrumentation (when used) to determine acceptable performance. Daily checks and calibration data will be entered on the appropriate Instrument Qualification Sheet (IQS). Reference 3.4 provides additional methods and procedures for daily qualification.

2.5 Acceptance Limits

The acceptance limits for radioactivity in soil are listed in Reference 3.5. For combinations, the unit sum of fractions rule will be applied. The following limits are taken from the Sitewide Criteria list:

Co-60	1.94 pCi/g
Sr-90	36.0 pCi/g
Cs-137	9.20 pCi/g

Additional limits for other detected radionuclides, if any, are in the Sitewide Criteria (Ref 3.5).

2.6 Final Survey Report

The performance of the qualitative scan, the selection and taking of soil samples, and the results of all analyses will be described in a Final Survey Report for the ISF, T654. This report will provide the details of the survey, copies of the survey records, and a listing of the measurements recorded. The results of gamma-spectromtry, specifically for Cs-137 and supplementally for other radionuclides, such as K-40 and the natural thorium and uranium chain, will be listed. The listing of results will include the analytical value, its assigned 2σ uncertainty, and the laboratory Minimum Detection Level. The results will be interpreted by use of CumPlot as appropriate This display will provide a 90/90/100 test (90% confidence that 90% of the area is below 100% of the limit) for the presence of Cs-137 exceeding the acceptance limit provided in

Reference 3.5 The single-nuclide limit for Cs-137 is 9.2 pCi/g. If other radionuclides are found, the appropriate limits will be calculated by the unit-sum-of-fractions rule.

The report will include locator maps and a connection to the State of California master geographic grid. (This may be done by use of a USGS topographic map or nearby benchmark.) It is recommended that several photographs with permanent landmarks be included, showing the survey locations. Photographs of the survey instrumentation, sampling and analysis equipment, and the drilling operation should be included.

2.7 Data Package

A data package for the D&D files will be prepared at the completion of the survey and final report. This package will include a copy of this procedure as marked up, a copy of the final survey report, copies of all analytical reports, correspondence related to this phase of the release process, and a copy of the Independent Verification Contractor review. Photos and other supplemental information will be included as appropriate. Correspondence related to the final release authorization will be added as it is received.

3. REFERENCES

3.1 Rocketdyne Document ESG-DOE-13507, "Interim Storage Facility Decommissioning Final Report", 3/15/85

3.2 Rocketdyne Document N001TI000188, "Interim Storage Facility Decommissioning Plan", 6/28/83

3.3 ORISE Document ORISE 96/C-4, "Verification Survey of the Interim Storage Facility; (and others)", February 1996

3.4 Rocketdyne Document N001OP000033, "Methods and Procedures for Radiological Monitoring"

3.5 Rocketdyne Document N001SRR140127, "Proposed Sitewide Release Criteria for Remediation of Facilities at the SSFL", 8/22/96

3.6 ETEC Document A4CM-SP-0001, "SSFL Area IV Gamma Survey Procedures in Support of the Site radiological Characterization Study", 9/20/94

3.7 Rocketdyne Form 732-A, Rev. 1-91, "Radiation Survey Report"

3.8 DOE Order 5400.5, "Radiation Protection of the Public and the Environment"

3.9 Rocketdyne Document N001OP000032, "Training Program for Radiation Protection and Health Physics Personnel"

3.10 Rocketdyne Document ER-AN-0005, "Training Plan for Environmental Restoration of Radioactively Contaminated Facilities", original dated September 17, 1991

3.11 Rocketdyne Environmental Control Manual

3.12 "Rocketdyne Master Emergency Plan", current copies are available at the Control Center, ETEC Library, Office of Environmental Remediation, and other locations

3.13 "Manual for Conducting Radiological Surveys in Support of License Termination", NUREG/CR-5849, Draft Report for Comment, ca. 1992

3.14 ETEC Document A4CM-ZR-0011, "Area IV Radiological Characterization Survey", August 15, 1996

4. SPECIAL EQUIPMENT/MATERIALS

4.1 Equipment

4.1.1 Ludlum Model 2220/1-ESG Scaler/Ratemeter

4.1.2 Ludlum Model 44-2 High-Energy Gamma Probe

4.1.3 Canberra Series 100 MCA System with High-Purity Germanium Detector

4.1.4 Ludlum Model 12 Countrate Meter

NOTE: "Or equivalent" applies to all above model numbers.

4.2 Special Instrumentation Instructions

Record the equipment number, serial number, date, calibration date, and this procedure number on all radiation survey reports (Reference 3.7) and any other survey information documentation.

5. GENERAL REQUIREMENTS

5.1 Safety Precautions Special Instructions

No special safety hazards to personnel and/or equipment should be present at the time of this survey, other than that normally associated with environmental work, such as snakes and poison oak. Two persons will be present while working at the facility.

5.1.1 General Health and Safety Instructions

The following general instructions will be observed by all personnel:

a) Protective Services will provide first aid support when required.

b) The Site Emergency Plan (Reference 3.12) is established and will be implemented as required. For the region of this work, this is pertinent to injuries, snake bite, and brush-fires.

5.2 Prerequisites

5.2.1 A single designated "working copy" of this final survey procedure will be utilized at the work site. Should changes become necessary, the working copy of this Survey Procedure (SP) will be redlined and approved at a minimum by the PIC and Environmental Remediation (ER); the program manager must approve and sign any changes affecting cost or schedule. At the completion of the task covered by this SP, the Survey Procedure, with all redline changes incorporated and signed, and the required Appendices, will be filed with ER in the T654 project file in building T100.

The designated "working copy" of this SP will be identified as such on the cover page and will be located in an area designated for working copies.

Site specific training (facility familiarization and this procedure) must be verified by the PIC.

PIC: _____

5.2.2 It is the responsibility of the PIC to verify that each employee working in the area has read and signed the control copy of this document to indicate understanding of the job and instructions.

PIC: _____

5.2.3 It is the responsibility of the PIC to assure that all personnel who will initial redlines for sign-offs, have signed the initial verification sheet in Appendix A. PIC: _____

5.2.4 It is the responsibility of the PIC to verify daily that all daily checks are made at the beginning of the work day. Acceptance limits for daily checks will be established for each instrument at ±20% about the initial calibration value.

PIC: _____

5.2.5 It is the responsibility of the PIC to assure that personnel performing this work have been trained as radiation workers, and are qualified and experienced in field survey work. No special protective clothing or other safeguards are needed.

PIC: _____

5.2.6 It is the responsibility of the PIC to discuss the tasks with the personnel performing the tasks at the start of each new assignment and on a daily basis during the duration of these operations.

PIC: _____

6. DETAILED SAMPLING PROCEDURE

PIC will verify that this procedure is the latest revision and give permission to proceed:

PIC:_____

Date_____ Time _____

6.1 Sample Lot Survey Procedure

6.1.1 Sample Lot Gridding

Starting in the northwest corner, lay out a uniform 3-m x 3-m grid on the ground surface. (This grid need be established only as a point of reference and need not be a physically marked grid.) One 1-m x 1-m area within each 3-m x 3-m grid in the affected area will be selected for sampling. The reference point for this grid may be chosen as the most suitable in the field. This may be one of the master grid corners established for the Area IV Characterization Survey (Ref. 3.14), a nearby geodetic benchmark, or the centrally located telephone pole.

6.1.2 Survey Records

The survey record will consist of a list of hotspots, if any are found in the qualitative gamma exposure rate scan, and identification and description of soil samples as taken by location. The sample identification will use the coding "ISFYYnnnn", in conformance with the adopted format for radiological samples. Attach one copy of the survey records for the sample lot to this procedure and provide ER with the originals for data analysis.

6.1.3 Surface Soil Sampling

With a clean shovel or trowel, collect enough soil from the surface to a depth of 6 inches to completely fill a 0.5-liter Marinelli beaker. Leave out rocks, organic materials such as twigs, leaves, droppings, and any industrial debris. Seal the Marinelli beaker with tape and label with the sample identifier. Enter the sample on the Chain-of-Custody form, for gamma spectrometry. (If the IVC surveyor wants a sample at this location, assist in splitting the sample material for this purpose. Indicate on the Survey Record that a split (or separate) sample was provided at this location.)

For the rock/soil contact at the SE edge of the facility, use a clean hoe or similar tool to collect soil from along the edge of the rock. Mix this soil well and fill a 0.5-liter Marinelli beaker. Seal the Marinelli beaker with tape and label with the sample identifier. Enter the sample on the Chain-of-Custody form, for gamma spectrometry. (If the IVC surveyor wants a sample at this location, assist in splitting the sample material for this purpose. Indicate on the Survey Record that a split

(or separate) sample was provided at this location.)

6.1.4 Subsurface Soil Sampling

As the drill reaches the desired depth, take enough soil to completely fill a 0.5-liter Marinelli beaker. Leave out rocks, organic materials such as roots, and any industrial debris. Seal the Marinelli beaker with tape and label with the sample identifier. Enter the sample on the Chain-of-Custody form, for gamma spectrometry. (If the IVC suveyor wants a sample at this location and depth, assist in splitting the sample material for this purpose. Indicate on the Survey Record that a split (or separate) sample was provided at this location.)

7. COMPLETION REVIEW AND APPROVAL

7.1 Procedure complete:

Survey PIC _____ Date _____

7.2 Procedure reviewed and satisfactory:

Project Engineer _____ Date _____

Quality Assurance _____ Date _____

Environmental Remediation _____ Date _____

Appendix A

Document Sign-Off Form

Name (signature)	SS#	Date	Verified (PIC)